SEASONAL INCIDENCE OF HELMINTHS IN THE BURCHELL'S ZEBRA

ROSINA C. SCIALDO(1), R. K. REINECKE(2) and V. DE VOS(2)

ABSTRACT


Ten Burchell's zebras were culled in conjunction with the Kruger National Park's game management programme. The colts ranged in age from 9-17 months and the stallions from 2½-23 years. The gastro-intestinal tract and the abdominal cavity were examined for helminths. The principal families of nematodes recovered included the Atractidae, Strongylidae and Spiruridae. The Atractidae included Crossocephalus and Probstmayria; the Strongylidae 2 subfamilies, Cyathostominae and Strongylinae, and the genera of the Cyathostominae were Cyathostomum, Cylcocyclocillos, Cylcodontophorus, Cylcostephanus, Cylinpharynx and Poteriostomum. Craterostomum, Oesophagodontus, Strongylus and Triodontophorus represent the Strongylinae. The last of the 3 principal families, the Spiruridae, included Draschia and Habronema. Total worm burdens ranged from 0-1 947-474. Despite the fact that the 3 families have life-cycles that differ greatly, their seasonal incidence over the 11-month period showed similar trends.

INTRODUCTION

As Burchell's zebra shares many nematodes with the domestic equids, any study of zebra parasites makes a contribution to our knowledge of equine helminthology as a whole.

The helminths of this zebra have been studied by a number of authors (Theiler, 1923; Curson, 1928; Mönig, 1928; Ortlepp, 1962; McCully, Kruger, Basson, Ebedes & Van Niekerk, 1969), and Round (1968) has compiled a check-list of these parasites. The seasonal incidence of helminths in the zebra, however, has not been studied.

This paper describes a survey conducted in Burchell's zebra in conjunction with the Kruger National Park's game management programme over a period of 11 months. Worm burdens and seasonal incidence are discussed.

MATERIALS AND METHODS

Study area

The zebra were culled in the area around Skukuza (24°59'S, 31°36'E) and in Tshokwane in the Kruger National Park in the Eastern Transvaal. The predominant types of vegetation in these areas are Red bushwillow veld, thorny thicket and knobthorn/marula veld (Van Wyk, 1972). This is a summer rainfall area and at Skukuza and Tshokwane little rain falls between May and November 1978 to September 1979. The animals were culled in the area around Skukuza for examination. They were skinned, eviscerated, the blood being collected for other purposes. The incisor teeth. The techniques of a post-mortem examination of an equid have been described by Malan, Reinecke, Wyk, 1972). This is a summer rainfall area and at Skukuza and Tshokwane little rain falls between May and November 1978 to September 1979. The animals were

Helminth collection

Two male zebras were shot on successive days in the Kruger National Park at intervals of 1 or 3 months from November 1978 to September 1979. The animals were bled, the blood being collected for other purposes. The carcasses were transported to the Veterinary Laboratory at Skukuza for examination. They were skinned, eviscerated and their ages estimated from an examination of the incisor teeth. The techniques of a post-mortem examination of an equid have been described by Malan, Reinecke & Scialdo (1981a, 1981b). In these zebras, however, the technique differed in 2 respects:

(a) the size of the aliquots was not standardized, and

(b) the caecum and colon walls were digested in pepsin/HCl, as described by Reinecke & Brooker (1972) to release the larvae that were counted microscopically, and not in situ, as described by Malan et al. (1981b).

Faeces were collected from the rectum for faecal worm egg counts and larval cultures.

RESULTS

The 20 genera that were recovered belong to 10 families. The principal nematode families include the Atractidae, Strongylidae and Spiruridae. The genera present from the Atractidae include Crossocephalus and Probstmayria. Those from the Strongylidae form 2 subfamilies, the Cyathostominae, which include Cyathostomum, Cylcocyclocillos, Cylcodontophorus, Cylcostephanus, Cylinpharynx and Poteriostomum and the Strongylinae which include Craterostomum, Oesophagodontus, Strongylus and Triodontophorus. The last of the 3 principal families, the Spiruridae, includes Draschia and Habronema. The numbers of worms recovered from these zebras are listed in Tables 1 & 2. The total and monthly worm burdens of the 3 families are summarized in Fig. 1.

FIG. 1 Seasonal variation in the mean numbers of nematodes belonging to the families Atractidae, Cyathostominae, Spiruridae and Strongylinae
### TABLE 1 Worm burdens and faecal worm egg counts of predominant nematodes recovered from Burchell’s zebra*  

<table>
<thead>
<tr>
<th>Zebra</th>
<th>Colt 1</th>
<th>Colt 2</th>
<th>Colt 3</th>
<th>Colt 4</th>
<th>Stallion 1</th>
<th>Stallion 2</th>
<th>Stallion 3</th>
<th>Stallion 4</th>
<th>Stallion 5</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>9 months</td>
<td>12 months</td>
<td>14 months</td>
<td>17 months</td>
<td>2½ years</td>
<td>6 years</td>
<td>7 years</td>
<td>7½ years</td>
<td>13 years</td>
<td>23 years</td>
</tr>
<tr>
<td>Eggs per gram of faeces</td>
<td>700</td>
<td>—</td>
<td>3 200</td>
<td>700</td>
<td>2 750</td>
<td>—</td>
<td>1 500</td>
<td>1 100</td>
<td>4 500</td>
<td>4 000</td>
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</table>

#### Atractidae

<table>
<thead>
<tr>
<th>Species</th>
<th>Colt 1</th>
<th>Colt 2</th>
<th>Colt 3</th>
<th>Colt 4</th>
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<th>Stallion 2</th>
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<th>Stallion 5</th>
<th>Stallion 6</th>
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<tbody>
<tr>
<td>Crossecephalus spp.</td>
<td>1 205</td>
<td>1 947 474</td>
<td>73</td>
<td>2</td>
<td>2 304</td>
<td>285</td>
<td>49 224</td>
<td>0</td>
<td>174 763</td>
<td>95 820</td>
</tr>
<tr>
<td>Probstoma vivipara</td>
<td>1 514 507</td>
<td>3 288 640</td>
<td>97 388</td>
<td>10 038 506</td>
<td>56 370</td>
<td>24 206 530</td>
<td>97 007</td>
<td>1 936 138</td>
<td>995 023</td>
<td>1 508 412</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1 526 532</td>
<td>5 236 114</td>
<td>97 461</td>
<td>10 038 508</td>
<td>58 674</td>
<td>24 206 615</td>
<td>146 231</td>
<td>1 936 138</td>
<td>1 169 786</td>
<td>1 604 232</td>
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#### Oxynidae

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<th>Stallion 2</th>
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<tbody>
<tr>
<td>Oxystoma equi</td>
<td>1 515</td>
<td>0</td>
<td>1 168</td>
<td>1 060</td>
<td>5</td>
<td>0</td>
<td>0</td>
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#### Spiruridae

<table>
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<tr>
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<th>Colt 4</th>
<th>Stallion 1</th>
<th>Stallion 2</th>
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<th>Stallion 4</th>
<th>Stallion 5</th>
<th>Stallion 6</th>
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<tbody>
<tr>
<td>Draschla spp.</td>
<td>27</td>
<td>145</td>
<td>317</td>
<td>7</td>
<td>56</td>
<td>1 173</td>
<td>1 159</td>
<td>953</td>
<td>493</td>
<td>228</td>
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<tr>
<td>Habronema spp.</td>
<td>46</td>
<td>4 351</td>
<td>103</td>
<td>66</td>
<td>164</td>
<td>2 017</td>
<td>855</td>
<td>130</td>
<td>258</td>
<td>70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>73</td>
<td>4 496</td>
<td>420</td>
<td>73</td>
<td>220</td>
<td>3 190</td>
<td>2 014</td>
<td>1 083</td>
<td>751</td>
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#### Strongylidae

**Cystodactylineae**

<table>
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<tr>
<th>Species</th>
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<th>Stallion 4</th>
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<tbody>
<tr>
<td>Strongylus asini</td>
<td>64</td>
<td>81</td>
<td>592</td>
<td>1 340</td>
<td>166</td>
<td>3 950</td>
<td>3 740</td>
<td>6 140</td>
<td>20</td>
<td>82</td>
</tr>
<tr>
<td>Strongylus edentatus</td>
<td>1 200</td>
<td>33 231</td>
<td>70</td>
<td>0</td>
<td>11</td>
<td>22 463</td>
<td>80</td>
<td>485</td>
<td>19 380</td>
<td>0</td>
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<tr>
<td>Cyathostomum spp.</td>
<td>870</td>
<td>19 441</td>
<td>71</td>
<td>1 072</td>
<td>6</td>
<td>5 437</td>
<td>7 370</td>
<td>2 182</td>
<td>7 033</td>
<td>2 081</td>
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<tr>
<td>Cyllocephala spp.</td>
<td>1 400</td>
<td>176 862</td>
<td>1 616</td>
<td>1 518</td>
<td>8</td>
<td>13 350</td>
<td>0</td>
<td>0</td>
<td>480</td>
<td>0</td>
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<tr>
<td>Cylicidontophorus spp.</td>
<td>0</td>
<td>6 646</td>
<td>52</td>
<td>40</td>
<td>10</td>
<td>176</td>
<td>35 600</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Cylicostephanus spp.</td>
<td>1 425</td>
<td>2 068</td>
<td>95</td>
<td>522</td>
<td>21</td>
<td>18 617</td>
<td>80</td>
<td>4 250</td>
<td>235</td>
<td>920</td>
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<tr>
<td>Cylicostephanus spp.</td>
<td>70</td>
<td>63</td>
<td>73</td>
<td>62</td>
<td>85</td>
<td>17 187</td>
<td>19 780</td>
<td>19 875</td>
<td>18 173</td>
<td>3 608</td>
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<tr>
<td>Poterostomum spp.</td>
<td>15</td>
<td>0</td>
<td>36</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>480</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5 040</td>
<td>238 392</td>
<td>2 605</td>
<td>4 574</td>
<td>307</td>
<td>81 180</td>
<td>66 650</td>
<td>32 952</td>
<td>45 801</td>
<td>6 691</td>
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</table>

**Strongylinae**

<table>
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<tr>
<th>Species</th>
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<th>Colt 3</th>
<th>Colt 4</th>
<th>Stallion 1</th>
<th>Stallion 2</th>
<th>Stallion 3</th>
<th>Stallion 4</th>
<th>Stallion 5</th>
<th>Stallion 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongylus spp.</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>552</td>
<td>3</td>
<td>1 308</td>
<td>160</td>
<td>1 680</td>
<td>1 320</td>
</tr>
<tr>
<td>Oesophagostomum robustus</td>
<td>0</td>
<td>966</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Strongylus spp.</td>
<td>30</td>
<td>54</td>
<td>172</td>
<td>138</td>
<td>47</td>
<td>104</td>
<td>116</td>
<td>87</td>
<td>45</td>
<td>104</td>
</tr>
<tr>
<td>Trichostephanus spp.</td>
<td>5</td>
<td>26</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>50</td>
<td>1 040</td>
<td>172</td>
<td>694</td>
<td>53</td>
<td>1 412</td>
<td>276</td>
<td>1 767</td>
<td>1 365</td>
<td>1 304</td>
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**Trichostrongylidae**

<table>
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<tr>
<th>Species</th>
<th>Colt 1</th>
<th>Colt 2</th>
<th>Colt 3</th>
<th>Colt 4</th>
<th>Stallion 1</th>
<th>Stallion 2</th>
<th>Stallion 3</th>
<th>Stallion 4</th>
<th>Stallion 5</th>
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</thead>
<tbody>
<tr>
<td>Trichostrongylus spp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>123</td>
<td>20</td>
<td>580</td>
</tr>
</tbody>
</table>

* Since procedures had not yet been standardized, the totals may not reflect valid numbers  
† Not identified to generic level

### TABLE 2 Analysis of Strongylus spp. recovered from Burchell’s zebra  

<table>
<thead>
<tr>
<th>Species</th>
<th>Colt 1</th>
<th>Colt 2</th>
<th>Colt 3</th>
<th>Colt 4</th>
<th>Stallion 1</th>
<th>Stallion 2</th>
<th>Stallion 3</th>
<th>Stallion 4</th>
<th>Stallion 5</th>
<th>Stallion 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongylus asini</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strongylus edentatus</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>84</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strongylus vulgaris</td>
<td>30</td>
<td>54</td>
<td>171</td>
<td>137</td>
<td>46</td>
<td>20</td>
<td>116</td>
<td>87</td>
<td>45</td>
<td>84</td>
</tr>
</tbody>
</table>
(a) Atractidae

_Crossocephalus_ spp. This genus was recovered from every animal except 1 stallion. In colts a range of 2–1 947 474 was recorded, and in stallions 0–174 763. Peak worm burdens in colts were recovered in November and in stallions in September.

_Probstmayria vivipara_ This species reflected the highest numbers of all helminths recovered. In colts they ranged from 97 388–10 038 506, and in stallions from 56 370–24 206 530. Peak worm burdens in colts were recorded in May and in stallions in November.

(b) Oxyuridae

_Oxyurus equi_. All but one of the colts and the youngest stallion (2½ years) were positive for this species, with numbers ranging from 5–1 515. The youngest colt (9 months old) had the highest adult worm burden of 1 255, while the young stallion had only 5 4th stage larvae (L₄) and no adult _O. equi_.

(c) Spiruridae

Both genera were present in all the animals.

_Draschia_ spp. Colts had a range of worms from 7–317 and stallions from 56–1 173. Peak burdens were noted in February for colts and in stallions in November.

_Habronema_ spp. The range recorded in colts was 46–4 351 and in stallions 70–2 017. The peak worm burdens in both colts and stallions were noted in November.

(d) Strongylidae

_Cyathostominae_

Fourth stage Cyathostominæ larvae (L₄) with range of 64–1 340 were recorded in colts, 20–6 140 in stallions and the peak worm burdens in colts and stallions occurred in May and August respectively. Adults had a range of 0–33 231 in colts, 0–22 463 in stallions and in both cases the maximum numbers were recorded in November.

Worm burdens of the genera of this subfamily were:

_Cyathostomum_ spp. These species were consistently present in moderate numbers ranging from 6–19 441.

_Cylicocyclus_ spp. Although 3 stallions had no worms of this genus, numbers ranged from 8–176 862 in the other animals.

_Cylcodontophorus_ spp. One colt and 3 stallions were negative from these species, and in the other animals 10–35 600 worms were recovered.

_Cylicostephanus_ spp. These were consistently present in numbers ranging from 21–18 617.

_Cylindropharynx_ spp. This genus was always present, ranging in numbers from 63–19 875.

_Poteriostomum_ spp. Only 3 animals were positive for this genus with very low numbers ranging from 15–480.

Strongylinae

_Craterostomum_ spp. This genus was recovered in 2 out of 4 colts and the highest burden for stallions was 1 880 in August.

_Oesophagodontus robustus_. Nine hundred and sixty were present in 1 colt only.

_Strongylus_ spp. In colts these ranged from 30–172 and in stallions from 45–116. An analysis of this genus is presented in Table 2.

_Strongylus asini_. This species was recorded from the livers of 2 animals. The livers, however, were not thoroughly examined and possibly higher numbers of _S. asini_ than we recorded may have been present.

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**Strongylus edentatus**. Small numbers of this species were recorded from 3 animals only, with worm burdens of 1, 20 and 84 respectively. The last-mentioned was recorded in November.

**Strongylus vulgaris**. This species was consistently present in all the animals. The range in colts was 30–171 and in stallions 20–116. The numbers tabulated for _S. vulgaris_ reflect adult stages except for 3 animals with larval stages. Colt 3 had 12 5th stage and 21 _L₄_; Stallion 1, 1 5th stage and 8 _L₄_; and finally Stallion 3 with 5 5th stage and 11 _L₄_. The peak month was February.

_Tridonophorus_ spp. The 4 colts had burdens ranging from 4–26. Only 1 stallion had 3.

(e) Trichostrongylidae

_Trichostrongylus_ spp. were found in the 4 oldest animals, those of 3 of these animals being recorded as _T. thomasi_. The range was 20–580 with the peak burden in September.

(f) Filariidae

_Setaria equina_ was recorded in 1 colt, which had only 1 worm, and in 2 stallions, which had 3 and 11 worms respectively.

(g) Strongyloidae

_Strongyloides westeri_. Only 10 worms were recovered in the youngest colt.

(h) Anoplocephalidae

_Anoplocephala_ spp. The burdens in 2 colts were 16 and 82 respectively, and the 4 oldest stallions had 2, 3, 4 and 25 worms respectively.

(i) Schistosomatidae

_Schistosoma_ spp. Two of the older animals had only 2 of this genus and 1 male schistosomés, and it was therefore not possible to determine the species.

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**DISCUSSION**

The survey was conducted over a period of 11 months and thus seasonal incidence cannot be compared from year to year.

The Atractidae, Cyathostominae and Spiruridae follow a similar seasonal trend, despite the fact that they have markedly different life cycles. To the best of our knowledge, the entire life cycle of the Atractidae is completed in one host, the Cyathostominae have free living larval stages and the Spiruridae have an arthropod as an intermediate host.

The highest numbers of adult _O. equi_ being present in the youngest zebra and the lowest numbers of _L₄_ being present in the older animal (Stallion 1) would seem to indicate a susceptibility of the colts and a resistance in the older stallions.

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